Actively Cooled Silicon Lightweight Mirrors for Far Infrared and Submillimeter Optical Systems, Phase II

Completed Technology Project (2004 - 2006)

Project Introduction

The NASA Space Science Enterprise has 2 themes requiring large, lightweight cryogenic mirrors: Astronomical Search for Origins and Planetary Systems (ASO) and the Beyond Einstein Initiative of the Structure and Evolution of the Universe (SEU). The long wavelength Far Infrared/Submillimeter (FIR/SMM) instruments of Space Technology 9, the SAFIR Observatory, the Space InfraRed Interferometric Telescope (SPIRIT), and the Submillimeter Probe of the Evolution of Cosmic Structure (SPECS) missions require the highest possible signal-to-noise ratio to resolve the emissions of protogalactic objects and galaxies. The development of 10-25 meter diameter cryogenic optics for the 20-800 microns bandwidth, with an areal density <5 kg/m2, and a surface figure specification of lambda/14 at 20 microns is required. There is a premium for wavelengths >100 microns to achieve mirror temperatures <10K. In fact, at 200 microns wavelength, the point source sensitivity is more dependent on temperature than on aperture size! During the Phase II project Schafer proposes to design, build and test a 0.5-m diameter actively cooled SLMS

TM

Far Infrared Submillimeter Prototype (FISP) mirror suitable for NASA FIR/SMM missions, thus maturing SLMS

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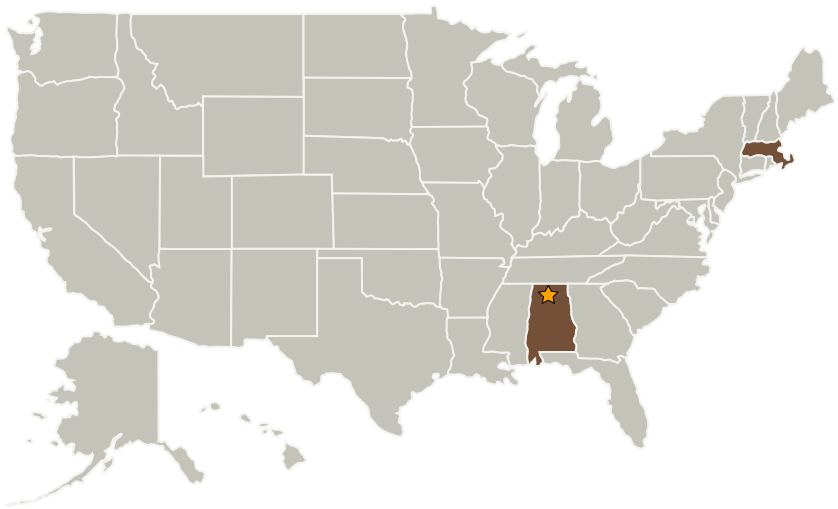
cryogenic mirror technology to TRL 5-6. Active cooling of SLMS

TM

mirrors to 4K is an enabling technology for future FIR/SMM instruments.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Schafer Corporation	Supporting Organization	Industry	Chelmsford, Massachusetts

Primary U.S. Work Locations	
Alabama	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems